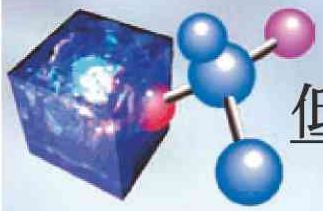
低温物質科学研究センターセミナー報告

LTM Center Seminar



低温物質科学研究センター セミナー

(平成 **24** 年度 第 **1** 回)

Electrons surfing on a sound wave: On-demand single electron transfer

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日時 ： **2012** 年 **4** 月 **5** 日 **(**木曜**) 11:00-**
April 5, Thursday, 11:00-

場所： 理学研究科 **5** 号館 **413** 号室
Room 413, Grad. School of Science Bldg. No.5

要旨：Single-electron circuitry is a promising route for quantum information processing, but requires a mechanism to transport single electrons from one functional part of the circuit to another. In quantum dots - small electronic islands, which can contain as little as a single electron-, this was only possible between quantum dots, which are spaced extremely closely. Indeed, when bringing two such quantum dots next to each other, quantum manipulations using the spin of the electrons can be performed. Up to now, highly controlled quantum operations between neighboring quantum dots have been achieved. For distances greater than a few hundred nanometers, however, this has stayed a challenge. Here we show that when propelled with a sound wave, a single electron can be transferred between two distant quantum dots, with very high fidelity [1,2]. This opens new avenues in the field of quantum computing with electrons.

[1] S. Hermelin, S. Takada, M. Yamamoto, S. Tarucha, A. D. Wieck, L. Saminadayar, C. Bäuerle, and T. Meunier, *Nature* **477**, 7365 (2011)

[2] R. Mc Nail *et al.*, *Nature* **477**, 7369 (2011)

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